Partial translation of JP-A-09-052776

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(54) Title of the Invention: Fiber bonded ceramic and its production process

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(translation of Abstract)

(57) [Abstract]
[Object] To provide a fiber bonded ceramic which has high strength and fracture resistance and can maintain excellent dynamic properties in air at 1,000 °C or higher.
[Constitution] The fiber bonded ceramic is composed of inorganic fibers of Si-M(Ti or Zr)-C-O, an inorganic material which contains Si-O and dispersed MC with 100 nm or less and exists so as to fill interstices between the inorganic fibers, and a carbon layer existing as a boundary layer between the inorganic fibers and the inorganic material, and the fiber bonded ceramic has an inorganic fiber content of at least 80 % by volume.

(translation of claims 1 and 2 at lines 1 - 35 in the left column of page 1)

[Scope of Patent Claims]

[Claim 1] A fiber-bonded ceramic composed of inorganic fibers containing an amorphous substance (a) comprising Si, M, C and O, an assembly (b) of crystalline

ultrafine particles of β-SiC, MC and C and amorphous substances of SiO_2 and MO_2 (M is Ti or Zr), or a mixture (c) of the above amorphous substance(a) and the above assembly (b), and

an inorganic substance containing an amorphous substance (d) comprising Si and O and optionally comprising M, a crystalline substance (e) comprising crystalline SiO_2 and/or MO_2, or a mixture (f) of the amorphous substance (d) and the crystalline substance (e), and further containing dispersed crystalline ultrafine particles of MC having a particle diameter of 100 nm or less, the inorganic substance existing so as to fill interstices between the inorganic fibers,

which ceramic is characterized in that the content of the inorganic fibers is at least 80 % by volume and that the fiber-bonded ceramic has layers with a thickness of 1 to 200nm comprising amorphous and/or crystalline carbon, as boundary layers between the inorganic fibers and the inorganic substance.

[Claim 2] A process for the production of a fiber-bonded ceramic, which process comprises hot-pressing a laminate material of inorganic fibers in an inert gas under a pressure of from 50 to 1,000 kg/cm^2 at a temperature of from 1,550 to1,850 °C,

wherein the inorganic fibers have an internal layer which is composed of an inorganic substance containing an amorphous substance (a) comprising Si, M, C and O, an assembly (b) of crystalline ultrafine particles of β-SiC, MC and C and amorphous substances of SiO_2 and MO_2 (M is Ti or Zr), or a mixture (c) of the above amorphous substance(a) and the above assembly (b) and a surface layer which is composed of an inorganic substance containing an amorphous substance (d) comprising Si and O and optionally comprising M, a crystalline substance (e) comprising crystalline SiO_2 and/or MO_2, or a mixture (f) of the

amorphous substance (d) and the crystalline substance (e), and wherein the surface layer has a thickness T (unit: μm) satisfying T = aD (in which a is from 0.023 to 0.053 and D is a diameter (unit: μm) of the inorganic fiber).

(translation of [0002] to [0005] at line 43 in the left column to line 17 in the right column in page 2)

[0002]

[Prior Arts and Problems thereof] JP-A-7-69747 discloses an inorganic fiber sintered body which is composed of inorganic fibers comprising Si, C, Ti or Zr, and O as constituent elements and an inorganic substance comprising Si, Ti or Zr and O as constituent elements and existing so as to fill interstices between the inorganic fibers and has layers with a thickness of 1 to 200 nm comprising an amorphous carbon and/or a crystalline carbon, as boundary layers between the inorganic fibers and the inorganic substance.

[0003] Further, the above publication discloses a process for the production of an inorganic fiber sintered body, which comprises sintering a laminate material of inorganic fibers having an internal layer comprising Si, C, Ti or Zr, and O as constituent elements and a surface layer comprising Si, Ti or Zr, and O as constituent elements by stepwise temperature-increasing in an inert gas under a pressure of from 50 to 1,000 kg/cm^2.

[0004] The inorganic fiber sintered body disclosed in the above publication has high fracture energy and excellent dynamic properties, while it shows plastic deformation behaviors at a high temperature of more than 1,300 °C in some cases. The above inorganic fiber sintered body is hopeful as a structural material and the structural material is required not to show plastic deformation behaviors even at a high

temperature.

[0005] Therefore, it is desired to develop a material which retains the high fracture energy and excellent dynamic properties of the inorganic fiber sintered body disclosed in the above publication and at the same time does not show plastic deformation behaviors even at an extremely high temperature of more than 1,300 °C.